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SYSTEM AND METHOD FOR PERSONALIZING DIALOGUE MENU FOR AN INTERACTIVE VOICE RESPONSE SYSTEM

Field of the Invention

The present invention is generally related to an interactive voice response (IVR) system and method, and more particularly to a system and method for personalizing a dialogue menu for an interactive voice response system.

Background of the Invention

Interactive voice response (IVR) systems have been widely used by many organizations to provide computerized customer support services, such as account access and technical support for products and services (e.g., retail, financial, administrative, etc.). When a support center with an IVR system is contacted by a caller, the caller is typically presented with voice information. The IVR system poses voice queries to the caller, typically in a menu-driven fashion. Then, the caller inputs responses via a touch-tone (e.g., dual-tone multifrequency (DTMF)) telephone to the voice queries from the IVR system. In most cases, the caller is then presented with additional voice queries based on the responses received.

button-pushing process, a caller normally is lost. This represents a major inconvenience to the user, and potentially a lost opportunity (customer) to the retailer, etc. Sometimes the user does not even know how to go back to the main menu. It is not uncommon for a caller to make many phone calls to get to the desired information or obtain the needed services. Consequently, the frustrated caller becomes an unhappy customer.

Thirdly, even if a caller is successful in navigating the complex menu, it is still inconvenient to go through the same long sequence again and again every time the caller accesses the same information. For example, a caller calls an 800 number to check the caller's bank account for a certain deposit check. The caller may have to make many calls during a period of several days. This caller must listen and go through the same menu(s) having a long sequence of buttons and commands repeatedly.

In one conventional system, a system and method are disclosed for graphically displaying and navigating through an interactive voice response menu. The emphasis is on displaying the IVR menu graphically on a computer screen to let a caller navigate the menu graphically. However, such a system does not present a personalized menu for a caller.

Furthermore, such a system does not keep track of caller's access patterns, nor does the system present another set of personalized menus for a caller based on the caller's prior access patterns.

receiving callers' specifications, a list of shortcuts to the desired destinations are provided in the personalized dialogue menu.

In another non-limiting embodiment of the present invention, the IVR system also tracks the caller's access patterns. A set of personalized menu are presented to a caller based on the caller's past access patterns.

A caller to such a personalized IVR system can access the desired information from the menu more quickly and efficiently according to the caller's personal interests. Besides the default standard system menu, the caller is also presented with a list of personalized shortcuts to go to the caller's desired destinations without the typical lengthy and time-consuming interactions with the IVR system.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a block diagram of a network system according to a first preferred embodiment of the present invention;

Figure 2 is a block diagram of an IVR system that supports personalizable dialogue menu according to an exemplary embodiment of the present invention;

Figure 3 is a block diagram of a conventional IVR dialogue menu;

Figure 4 illustrates a personalized IVR menu according to a first preferred embodiment of the present invention;

Figure 5 is a flow diagram of the operation of an IVR system supporting the personalizable dialogue menu according to the present invention;

Figure 6 illustrates another exemplary personalized dialogue menu for an IVR system;

exemplary embodiment of the present invention, the IVR system 120 also stores customer profiles containing personalized dialogue menus which can be specified by the users or suggested by the IVR system based on the user's previous access patterns.

Finally, the IVR system 120 may also have an IP (Internet Protocol) connection to a data network, such as the Internet 130, an intranet (not shown), a personal area network (PAN) (not shown), and the like, through which the dialogue menu can be customized by the user with a browser running on a computer 141, 142, 143.

Figure 2 is a block diagram of an IVR system 200 that supports a personalizable dialogue menu in accordance with an exemplary embodiment of the present invention.

As shown in Figure 2, the IVR system 200 preferably includes a computer system including a CPU 210, a fixed or removable storage device (e.g., hereafter referred to as a "disk", for convenience, but obviously not limited thereto) 211 and a dynamic random access memory 212. The IVR system 200 preferably is connected to both the PSTN 201 and the Internet 202. User profiles, as well as their personalized dialogue menus, are stored on disk 211 and can be fetched into the dynamic random memory 212 for processing by the CPU 210. The software program logic 220 for the IVR system 200 is also stored on disk 211 as executable code and can be loaded into the memory 212 as needed to perform the IVR functions.

The major functional modules of the IVR system that support a personalizable dialogue menu include a phone interface module 230, a dialogue handler module 231, a dialogue logging and analysis module 232, a dialogue auto (automatic) playout

The outputs of the dialogue handler module 231 determine the messages that go back to the phone users. The inputs of dialogue handler module 231 are derived from user inputs either via DTMF or voice messages from the phone users. The FSM is constructed based on the dialogue menu such as that described below with regard to Figure 3. Basically, the FSM takes an input from the phone user and makes a state transition. Each state is corresponding to a node in the directed graph represented by the dialogue menu.

The dialogue logging and analysis module 232 records the dialogues between the IVR system and the phone users (e.g., automatically). It logs the input sequences from each phone user of the IVR system while he/she conducts dialogues with the IVR system. The information collected can be used to analyze each user's access patterns.

The analyzed access patterns, such as the latest dialogue paths or the most frequently traversed dialogue paths, can then be used to provide shortcuts for personalized access to the frequently accessed information for the phone users. The IVR system can provide such personalized direct access automatically when a phone user next calls the IVR system. Alternatively, the IVR system can suggest such access patterns to the users for creating personalized menus.

The dialogue auto playout module 233 facilitates the personalized access of information by the users. If a user decides to use his/her personalized shortcuts, the control sequences representing the shortcuts will be fed into the dialogue auto playout module 233.

system to the user. If the user presses 2 again, then the user must listen to another list of options 304. Finally, if the user presses 2 again, then the user must listen to the message of transferring fund balance by dollar amount 305.

One major drawback of the above-described IVR dialogue menu is that a user cannot change the flow of the IVR operations. Namely, a user cannot change the design of the dialogue menu. It is not possible to program one's own personalized dialogue menu where shortcuts can be provided for more efficient navigation of the dialogue menu. Each user must listen to the same hierarchical dialogue menu step-by-step (e.g., sequentially) in order to reach the desired information source.

For example, if a user is just interested in transferring the user's fund balance by dollar amount, the user must press a sequence of keys (e.g., three keys such as pressing 2 followed by 2 followed by another 2). For this simple IVR application, the user must wait for the IVR to repeat the voice messages on the menu before it reaches what the user desires. This is usually time-consuming and error-prone, especially if the IVR dialogue menu is a complex and deep hierarchical menu. The user of a complicated IVR system can easily be lost.

Figure 4 shows a personalized IVR menu in accordance with an exemplary embodiment of the present invention. Here, the IVR main menu 402 contains a list of personalized shortcut paths in addition to the default main menu. The option for changing one's personalized menu is also provided in the main menu. There can be two kinds of shortcuts. One is user-defined and the other is system-analyzed.

User-defined shortcuts are defined by the user via the phone or via the Web. For example, option 1 in the main menu 402 represents a shortcut for a key sequence

the IVR system retrieves the user's profile, including system-analyzed and user-defined personalized shortcuts, to construct the personalized main menu (e.g., step 504). The personalized main menu (see block 402 in Figure 4) typically contains a list of personalized shortcuts, a default main menu, and the option to change the personalized menu. It is noted that the user can select to turn off (e.g., deactivate) the personalizable menu for whatever reason. Such a deactivation would be performed just prior to step 504.

Depending on the inputs by the user, either via keypad or voice, there are basically two options (e.g., one of which is selected in step 505). A first option is to navigate the IVR system and the other option is to change the personalized menu.

For navigation (e.g., steps 506 and beyond), if it is a shortcut, then the dialogue auto playout module 233 is invoked to provide the direct messages to the user. If it is a traversal of the default menu, then the dialogue handler module 231 is used to provide interactions with the user.

In both cases, the IVR system checks to see if the navigation is finished (step 506). If not, it takes the input from the user and plays out either the menu options or messages (step 507). For every user action, in step 508 the access patterns are recorded by the dialogue logging and analysis module 232.

After navigation is completed (e.g., "YES" in step 506), the recorded user access patterns are analyzed (step 509). These access patterns are then used to update the user's personalized menu, if necessary. For example, a user may ask the IVR system to provide a shortcut to the most frequently accessed dialogue path in the

appropriate sub-menu. In block 602, the user-defined shortcuts are then listed. In block 603, the system-analyzed shortcuts are listed. Even within 602 and 603, another simplified hierarchical menu can also be designed by the user.

Those skilled in the art will also appreciate that a simplified tree can also be derived directly from the default menu by a tree-collapsing method. This tree-collapsing method essentially prunes: (1) branches leading to leaf nodes that are not chosen; and (2) unnecessary intermediate nodes from a chosen node to the nearest common ancestor node of another chosen node.

Figure 7 and 8 are examples of a tree-collapsing method to construct a simplified personalized menu from a standard menu.

Figure 7 shows a standard menu with node a (701) as the main menu. Figure 7 also shows that nodes e, g, o, and r (705, 706, 715, and 718) have been chosen by a user to be the preferred information sources.

Accordingly, using the above-described tree-collapsing scheme in which pruning branches leading to leaf nodes that are not chosen, is performed, the branches leading to leaf nodes h, j, k, l, and p (708, 710, 711, 712, and 716) will be pruned. The intermediate nodes d, f, n, and q (704, 707, 714, and 717) will also be pruned. Such nodes are pruned since they are not needed to provide a menu choice.

However, nodes c and m (703 and 713) will be kept because they are the nearest common ancestors of different chosen leaf nodes. Node b (702) will be pruned since it is not a nearest common ancestor of any two chosen leaf nodes. Node a 701 will also be kept since it is the nearest common ancestor of nodes c and m (703

and 713), and these two nodes are preserved because they are the nearest common ancestors of different chosen leaf nodes.

Figure 8 is the resultant simplified personalized menu from Figure 7. It starts with node a (801) and then has two branches to nodes c and m (803 and 813). From node c (803), there are two branches to the chosen nodes e and g (805 and 806). From node m (813), there are two branches to the chosen nodes o and r (815 and 818).

Furthermore, in another aspect of the invention, those skilled in the art will appreciate that, with dialogue logging and analysis, it becomes possible to implement targeted advertisement insertion based on a "collaborative filtering" approach.

Basically, collaborative filtering categorizes all the users into one or more clusters based on a set of shown interests or purchased items. Within a cluster, the users share certain common characteristics, such as they all express interest in a certain book. However, each user may also have other unique characteristics.

For example, user A has read Books N, O, and P and user B has read Books O, P and L. Users A and B are in the same cluster based on the books that both have read. Book N represents a unique characteristic of user A while Book L represents another unique characteristic of user B. These unique characteristics can be used as a basis for cross-promotion to users within a cluster. For example, Book N can be cross-promoted to user B (e.g., based on User A's reading of the book) while Book L can be cross-promoted to user A (e.g., based on User B's reading of the Book L).

Thus, the users of an IVR system can be categorized into various clusters/bins according to their past accessing patterns. Each member of the cluster share a common attribute. The member(s) of the cluster may have purchased a unique item

hardware above, to perform the method of personalizing an IVR system, as described above.

This signal-bearing media may include, for example, a RAM (not shown) contained within the CPU 210, as represented by the fast-access storage for example. Alternatively, the instructions may be contained in another signal-bearing media, such as a magnetic data storage diskette 900 (Figure 9), directly or indirectly accessible by the CPU 210.

Whether contained in the diskette 900, disk 211, the CPU 210, or elsewhere, the instructions may be stored on a variety of machine-readable data storage media, such as DASD storage (e.g., a conventional "hard drive" or a RAID array), magnetic tape, electronic read-only memory (e.g., ROM, EPROM, or EEPROM), an optical storage device (e.g. CD-ROM, WORM, DVD, digital optical tape, etc.), paper "punch" cards, or other suitable signal-bearing media including transmission media such as digital and analog and communication links and wireless. In an illustrative embodiment of the invention, the machine-readable instructions may comprise software object code, compiled from a language such as "C", etc.

While the invention has been described in terms of a preferred embodiment, those skilled in the art will recognize that the invention can be practiced with modification within the spirit and scope of the appended claims.

6. The method of claim 4, wherein said shortcut is based on a most-frequently accessed IVR pattern.

7. The method of claim 3, wherein a specification of said personalized IVR menu is performed over a telephone.

8. The method of claim 3, wherein a specification of said personalized IVR menu is performed over a network.

9. The method according to claim 8, wherein said network comprises at least one of a World-Wide-Web (WWW), an intranet, and a personal area network (PAN).

10. The method of claim 1, further comprising:

displaying to said caller said IVR menu to reduce a number of key sequences during interactions.

11. The method of claim 10, further comprising:

performing a tree-based collapsing of said personalized IVR dialogue menu.

12. The method of claim 1, further comprising:

inserting a personalized sub-menu into said personalized IVR dialogue menu.

13. The method according to claim 1, further comprising:

a telephone interface module for selectively interfacing with said PSTN and for selectively receiving a predetermined tone and a voice input from said caller via the PSTN,

said telephone interface module selectively transmitting at least one of synthesized and stored voice messages to said caller via the PSTN,

wherein said personalized IVR dialogue menu is configurable by said caller through the PSTN via said telephone interface module.

20. The system according to claim 16, wherein said retrieval unit further includes:

a dialogue handler, coupled to receive an input from said caller, for modeling state transitions of said system, to provide an output,

the output of said dialogue handler module determining a message to be returned to said caller, and an input of said dialogue handler module being derived from a caller input via at least one of a predetermined tone and a voice message from said caller.

21. The system according to claim 16, wherein said retrieval unit further includes:

a dialogue logging and analysis module for recording a dialogue between the IVR system and said caller, and logging input sequences from said caller of the IVR system while said caller conducts said dialogue with said IVR system,

wherein said input sequences logged are for analyzing said caller's access patterns.

once specified by said caller, the personalized menu is represented by one of a list of direct dialogue paths to desired information and a hierarchical dialogue menu.

26. The system according to claim 19, wherein said retrieval unit further includes:

a network interface module for communicating with external systems via the network to retrieve information for the IVR system to playback via said telephone interface module,

wherein said network interface module presents a configurable menu to the caller via the network for the caller to specify the caller's personalized dialogue menu,

wherein the network interface module parses text messages into a predetermined format such that the parsed text messages are used to interact with the caller through said telephone interface module.

27. The system according to claim 18, wherein said network includes at least one of the Internet, an intranet, and a personal area network.

28. A signal-bearing medium tangibly embodying a program of machine-readable instructions executable by a digital processing apparatus to perform a method for method for personalizing an interactive voice response (IVR) system to reduce a number of key sequences to reach a desired source of information, said method comprising:

storing a caller profile; and

retrieving the caller's profile to construct a personalized IVR dialogue menu and play out the personalized menu.